# 74HCU04-Q100

## Hex unbuffered inverter

Rev. 2 — 22 October 2015 **Product data sheet**

## 1. General description

The 74HCU04-Q100 is a hex unbuffered inverter. Inputs include clamp diodes that enable the use of current limiting resistors to interface inputs to voltages in excess of $V_{CC}$.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from –40 °C to +85 °C and from –40 °C to +125 °C
- Complies with JEDEC standard JESD7A
- Balanced propagation delays
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)
- Multiple package options

## 3. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74HCU04D-Q100 | –40 °C to +125 °C | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |
| 74HCU04PW-Q100 | –40 °C to +125 °C | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |
| 74HCU04BQ-Q100 | –40 °C to +125 °C | DHVQFN14 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm | SOT762-1 |

nexperia

## 4. Functional diagram

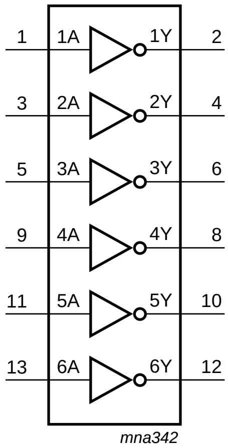



**Fig 1. Logic symbol**

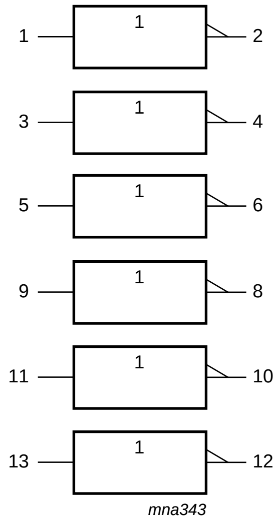



**Fig 2. IEC logic symbol**

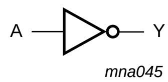



**Fig 3. Logic diagram (one inverter)**

## 5. Pinning information

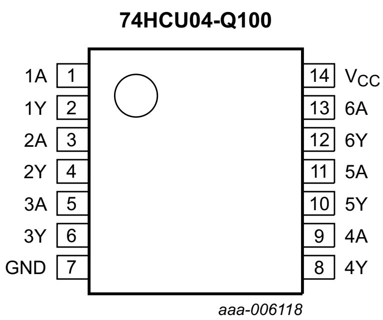
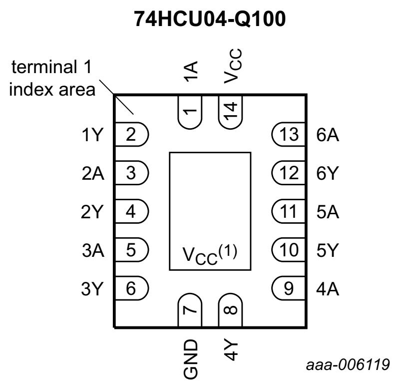



**Fig 4. Pin configuration SO14 and TSSOP14**




Transparent top view

(1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to $V_{CC}$.

**Fig 5. Pin configuration DHVQFN14**

### 5.1 Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| 1A | 1 | data input |
| 1Y | 2 | data output |
| 2A | 3 | data input |
| 2Y | 4 | data output |
| 3A | 5 | data input |
| 3Y | 6 | data output |
| GND | 7 | ground (0 V) |
| 4Y | 8 | data output |
| 4A | 9 | data input |
| 5Y | 10 | data output |
| 5A | 11 | data input |
| 6Y | 12 | data output |
| 6A | 13 | data input |
| $V_{CC}$ | 14 | supply voltage |

## 6. Functional description

**Table 3. Function table**

*H = HIGH voltage level; L = LOW voltage level*

| Input | Output |
|---|---|
| **nA** | **nY** |
| L | H |
| H | L |

## 7. Limiting values

**Table 4. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | | –0.5 | +7.0 | V |
| $I_{IK}$ | input clamping current | $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V | [1] | - | ±20 | mA |
| $I_{OK}$ | output clamping current | $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V | [1] | - | ±50 | mA |
| $I_O$ | output current | $-0.5$ V $< V_O < V_{CC} + 0.5$ V | | - | ±25 | mA |
| $I_{CC}$ | supply current | | | - | 50 | mA |
| $I_{GND}$ | ground current | | | –50 | - | mA |
| $T_{stg}$ | storage temperature | | | –65 | +150 | °C |
| $P_{tot}$ | total power dissipation | | [2] | | | |
| | SO14, TSSOP14 and DHVQFN14 packages | | | - | 500 | mW |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For SO14 package: $P_{tot}$ derates linearly with 8 mW/K above 70 °C.
For TSSOP14 packages: $P_{tot}$ derates linearly with 5.5 mW/K above 60 °C.
For DHVQFN14 packages: $P_{tot}$ derates linearly with 4.5 mW/K above 60 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

*Voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | | 2.0 | 5.0 | 6.0 | V |
| $V_I$ | input voltage | | | 0 | - | $V_{CC}$ | V |
| $V_O$ | output voltage | | | 0 | - | $V_{CC}$ | V |
| $T_{amb}$ | ambient temperature | | | –40 | +25 | +125 | °C |

## 9. Static characteristics

**Table 6. Static characteristics**

*Voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 2.0 V | 1.7 | 1.4 | - | 1.7 | - | 1.7 | - | V |
| | | $V_{CC}$ = 4.5 V | 3.6 | 2.6 | - | 3.6 | - | 3.6 | - | V |
| | | $V_{CC}$ = 5.5 V | 4.8 | 3.4 | - | 4.8 | - | 4.8 | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 2.0 V | - | 0.6 | 0.3 | - | 0.3 | - | 0.3 | V |
| | | $V_{CC}$ = 4.5 V | - | 1.9 | 0.9 | - | 0.9 | - | 0.9 | V |
| | | $V_{CC}$ = 5.5 V | - | 2.6 | 1.2 | - | 1.2 | - | 1.2 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | | | | | |
| | | $I_O$ = –20 µA; $V_{CC}$ = 2.0 V | 1.8 | 2.0 | - | 1.8 | - | 1.8 | - | V |
| | | $I_O$ = –20 µA; $V_{CC}$ = 4.5 V | 4.0 | 4.5 | - | 4.0 | - | 4.0 | - | V |
| | | $I_O$ = –4.0 mA; $V_{CC}$ = 4.5 V | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| | | $I_O$ = –20 µA; $V_{CC}$ = 6.0 V | 5.5 | 6.0 | - | 5.5 | - | 5.5 | - | V |
| | | $I_O$ = –5.2 mA; $V_{CC}$ = 6.0 V | 5.48 | 5.81 | - | 5.34 | - | 5.2 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | | | | | |
| | | $I_O$ = 20 µA; $V_{CC}$ = 2.0 V | - | 0 | 0.2 | - | 0.2 | - | 0.2 | V |
| | | $I_O$ = 20 µA; $V_{CC}$ = 4.5 V | - | 0 | 0.5 | - | 0.5 | - | 0.5 | V |
| | | $I_O$ = 4.0 mA; $V_{CC}$ = 4.5 V | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| | | $I_O$ = 20 µA; $V_{CC}$ = 6.0 V | - | 0 | 0.5 | - | 0.5 | - | 0.5 | V |
| | | $I_O$ = 5.2 mA; $V_{CC}$ = 6.0 V | - | 0.16 | 0.26 | - | 0.33 | - | 0.4 | V |
| $I_I$ | input leakage current | $V_I$ = $V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | µA |
| $I_{CC}$ | supply current | $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 2 | - | 20 | - | 20 | µA |
| $C_I$ | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

*Voltages are referenced to GND (ground = 0 V); For test circuit see Figure 7.*

| Symbol | Parameter | Conditions | | 25 °C | | −40 °C to +85 °C | −40 °C to +125 °C | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | | Typ | Max | Max | Max | |
| $t_{pd}$ | propagation delay | nA to nY; see Figure 6 | [1] | | | | | |
| | | $V_{CC}$ = 2.0 V; $C_L$ = 50 pF | | 19 | 70 | 90 | 105 | ns |
| | | $V_{CC}$ = 4.5 V; $C_L$ = 50 pF | | 7 | 14 | 18 | 21 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | | 5 | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V; $C_L$ = 50 pF | | 6 | 12 | 15 | 18 | ns |
| $t_t$ | transition time | see Figure 6 | [2] | | | | | |
| | | $V_{CC}$ = 2.0 V; $C_L$ = 50 pF | | 19 | 75 | 95 | 110 | ns |
| | | $V_{CC}$ = 4.5 V; $C_L$ = 50 pF | | 7 | 15 | 19 | 22 | ns |
| | | $V_{CC}$ = 6.0 V; $C_L$ = 50 pF | | 6 | 13 | 16 | 19 | ns |
| $C_{PD}$ | power dissipation capacitance | per inverter; $V_I$ = GND to $V_{CC}$ | [3] | 10 | - | | | pF |

[1] $t_{pd}$ is the same as $t_{PHL}$, $t_{PLH}$.

[2] $t_t$ is the same as $t_{THL}$, $t_{TLH}$.

[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:

$f_i$ = input frequency in MHz;

$f_o$ = output frequency in MHz;

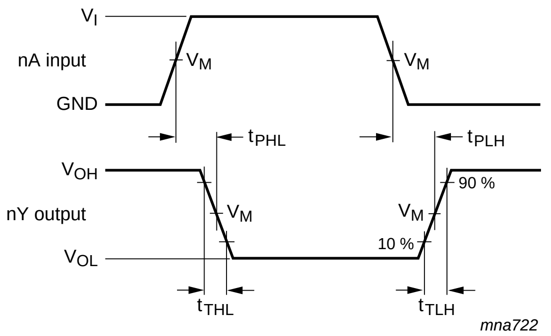
$C_L$ = output load capacitance in pF;

$V_{CC}$ = supply voltage in V;

N = number of inputs switching;

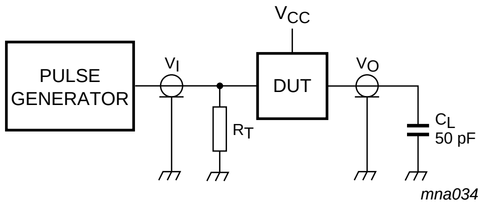
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

## 11. Waveforms




$V_M = 0.5 \times V_{CC}$; $V_I$ = GND to $V_{CC}$.

**Fig 6. The input (nA) to output (nY) propagation delay times**



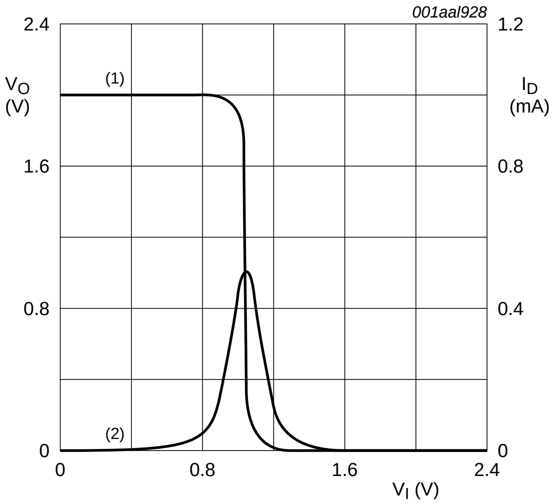

Definitions for test circuit:

$C_L$ = Load capacitance including jig and probe capacitance.

$R_T$ = Termination resistance should be equal to output impedance $Z_o$ of the pulse generator.

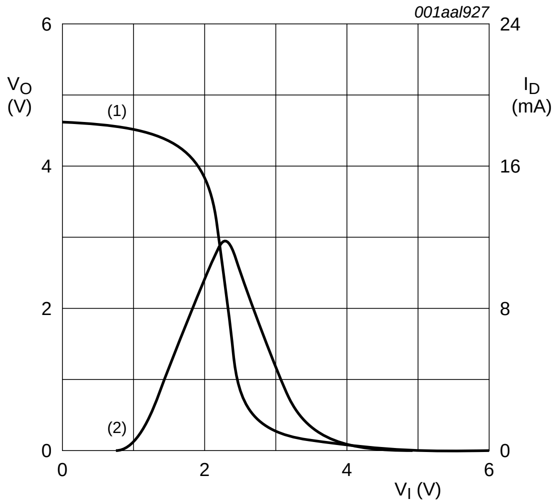
**Fig 7. Load circuit for switching times**

## 12. Typical transfer characteristics



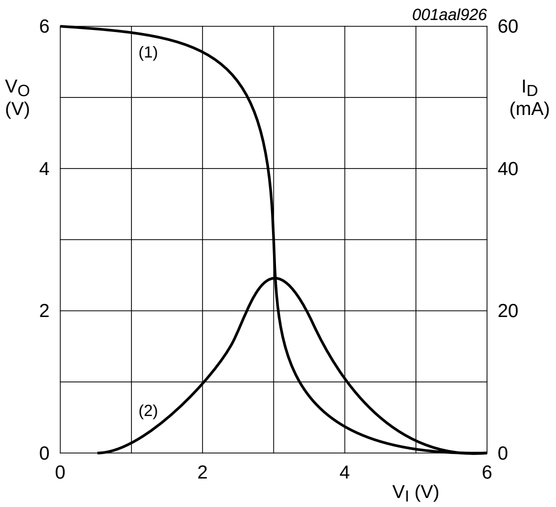

$T_{amb} = 25\ °C$.

**Fig 8. $V_{CC}$ = 2.0 V; $I_O$ = 0 A**



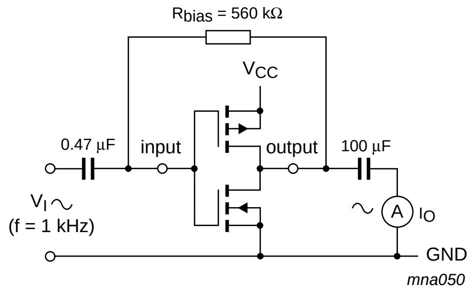

$T_{amb} = 25\ °C$.

**Fig 9. $V_{CC}$ = 4.5 V; $I_O$ = 0 A**




$T_{amb}$ = 25 °C.

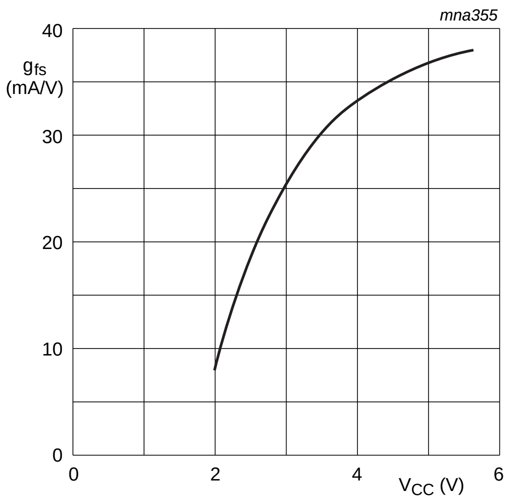
**Fig 10. $V_{CC}$ = 6.0 V; $I_O$ = 0 A**




$$g_{fs} = \frac{\Delta I_O}{\Delta V_I}$$

$f_i$ = 1 kHz at $V_O$ is constant

**Fig 11. Test set-up for measuring forward transconductance**




$T_{amb}$ = 25 °C.

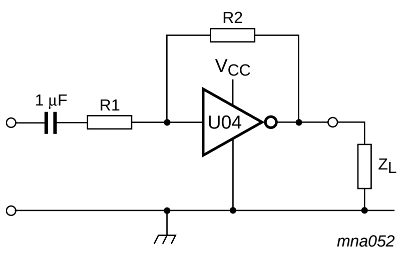
**Fig 12. Typical forward transconductance as a function of the supply voltage**

## 13. Application information

Some applications are:

- Linear amplifier (see Figure 13)
- Crystal oscillator design (see Figure 14)
- Astable multivibrator (see Figure 15)

**Remark:** All values given are typical unless otherwise specified.




Maximum $V_{o(p-p)} = V_{CC} - 2.0$ V centered at $0.5 \times V_{CC}$.

$$G_v = -\frac{G_{ol}}{1 + \frac{R1}{R2}(1 + G_{ol})}$$

$G_{ol}$ = open loop gain

$G_v$ = voltage gain

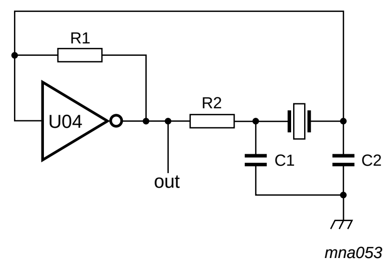
R1 ≥ 3 kΩ, R2 ≤ 1 MΩ

$Z_L$ > 10 kΩ; $G_{ol}$ = 20 (typical)

$V_{CC}$ = 6.0 V

Typical unity gain bandwidth product is 5 MHz.

**Fig 13. Used as a linear amplifier**




C1 = 47 pF (typical)

C2 = 33 pF (typical)

R1 = 1 MΩ to 10 MΩ (typical

R2 optimum value depends on the frequency and required stability against changes in $V_{CC}$ or average minimum $I_{CC}$. $I_{CC}$ is typically 5 mA at $V_{CC}$ = 5 V and $f_i$ = 10 MHz.

**Fig 14. Crystal oscillator configuration**

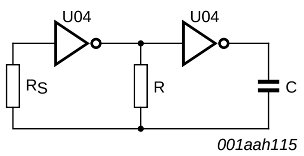
**Table 8. External components for resonator (f < 1 MHz)**

*All values given are typical and must be used as an initial set-up.*

| Frequency | R1 | R2 | C1 | C2 |
|---|---|---|---|---|
| 10 kHz to 15.9 kHz | 22 MΩ | 220 kΩ | 56 pF | 20 pF |
| 16 kHz to 24.9 kHz | 22 MΩ | 220 kΩ | 56 pF | 10 pF |
| 25 kHz to 54.9 kHz | 22 MΩ | 100 kΩ | 56 pF | 10 pF |
| 55 kHz to 129.9 kHz | 22 MΩ | 100 kΩ | 47 pF | 5 pF |
| 130 kHz to 199.9 kHz | 22 MΩ | 47 kΩ | 47 pF | 5 pF |
| 200 kHz to 349.9 kHz | 10 MΩ | 47 kΩ | 47 pF | 5 pF |
| 350 kHz to 600 kHz | 10 MΩ | 47 kΩ | 47 pF | 5 pF |

**Table 9. Optimum value for R2**

| Frequency | R2 | Optimum for |
|---|---|---|
| 3 kHz | 2.0 kΩ | minimum required $I_{CC}$ |
| | 8.0 kΩ | minimum influence due to change in $V_{CC}$ |
| 6 kHz | 1.0 kΩ | minimum required $I_{CC}$ |
| | 4.7 kΩ | minimum influence by $V_{CC}$ |
| 10 kHz | 0.5 kΩ | minimum required $I_{CC}$ |
| | 2.0 kΩ | minimum influence by $V_{CC}$ |
| 14 kHz | 0.5 kΩ | minimum required $I_{CC}$ |
| | 1.0 kΩ | minimum influence by $V_{CC}$ |
| >14 kHz | - | replace R2 by C3 with a typical value of 35 pF |

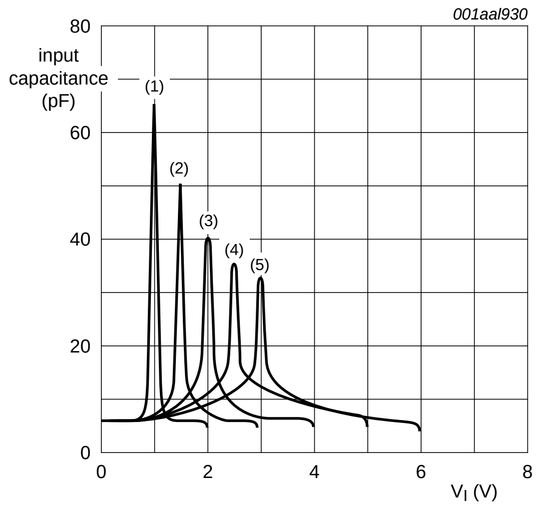



$$f = \frac{1}{T} \approx \frac{1}{2.2RC}$$

$$R_S \approx 2 \times R$$

The average $I_{CC}$ (mA) is approximately 3.5 + 0.05 × f (MHz) × C (pF) at $V_{CC}$ = 5.0 V.

**Fig 15. Astable multivibrator**




(1) $V_{CC}$ = 2.0 V

(2) $V_{CC}$ = 3.0 V

(3) $V_{CC}$ = 4.0 V

(4) $V_{CC}$ = 5.0 V

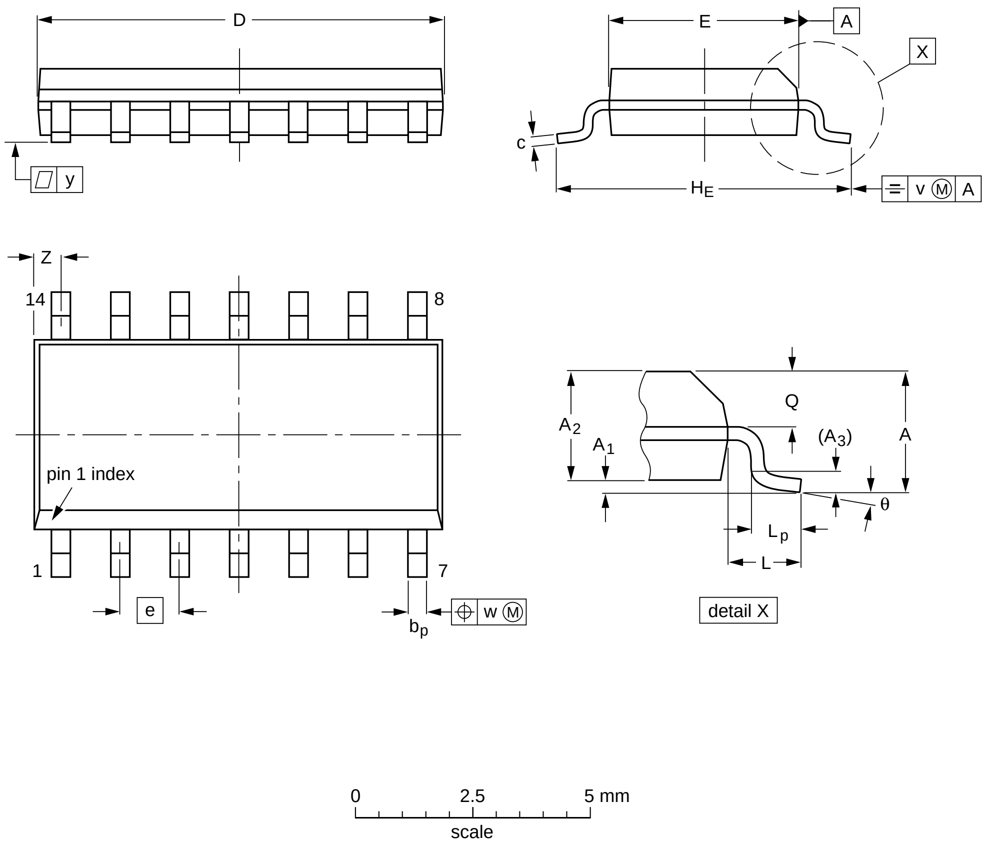
(5) $V_{CC}$ = 6.0 V

$T_{amb}$ = 25 °C.

**Fig 16. Input capacitance as function of input voltage**

## 14. Package outline

**SO14: plastic small outline package; 14 leads; body width 3.9 mm** **SOT108-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D(1) | E(1) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.75 | 0.25<br>0.10 | 1.45<br>1.25 | 0.25 | 0.49<br>0.36 | 0.25<br>0.19 | 8.75<br>8.55 | 4.0<br>3.8 | 1.27 | 6.2<br>5.8 | 1.05 | 1.0<br>0.4 | 0.7<br>0.6 | 0.25 | 0.25 | 0.1 | 0.7<br>0.3 | 8°<br>0° |
| inches | 0.069 | 0.010<br>0.004 | 0.057<br>0.049 | 0.01 | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.35<br>0.34 | 0.16<br>0.15 | 0.05 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012 | |

**Note**

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

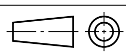
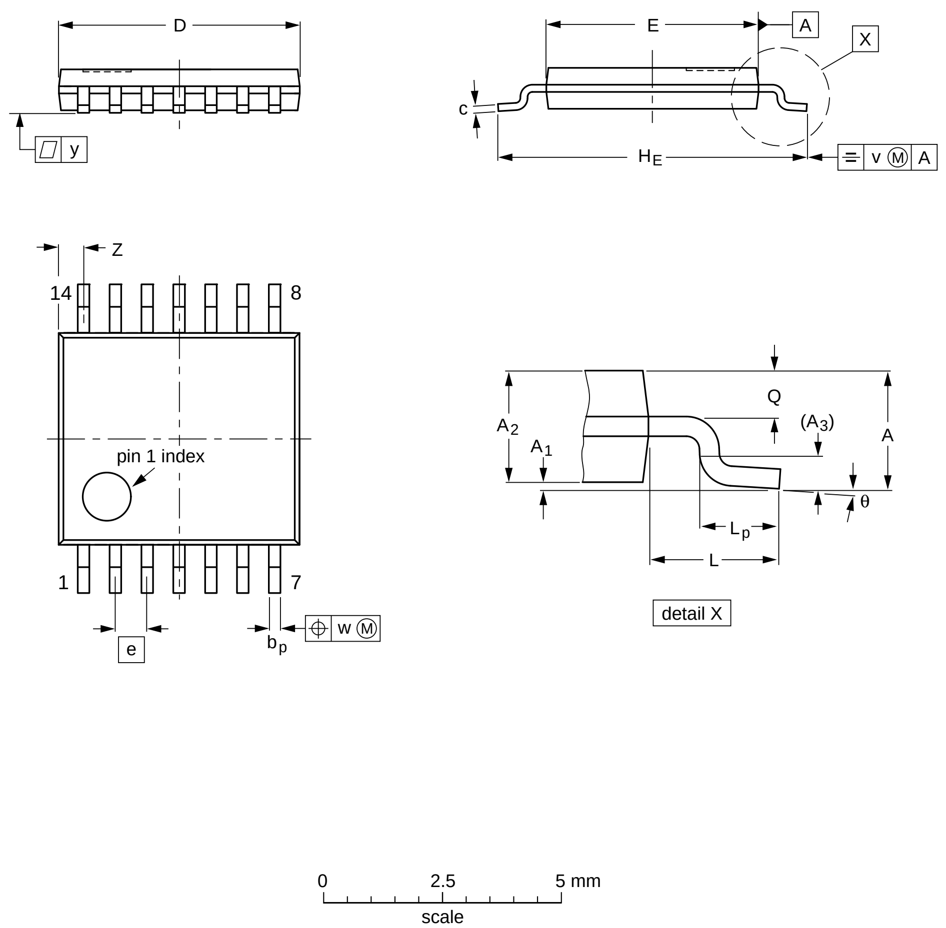
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT108-1 | 076E06 | MS-012 | | |  | ~~99-12-27~~<br>03-02-19 |

**Fig 17. Package outline SOT108-1 (SO14)**

**TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm** **SOT402-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (2) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1 | 0.15<br>0.05 | 0.95<br>0.80 | 0.25 | 0.30<br>0.19 | 0.2<br>0.1 | 5.1<br>4.9 | 4.5<br>4.3 | 0.65 | 6.6<br>6.2 | 1 | 0.75<br>0.50 | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.72<br>0.38 | $8^o$<br>$0^o$ |

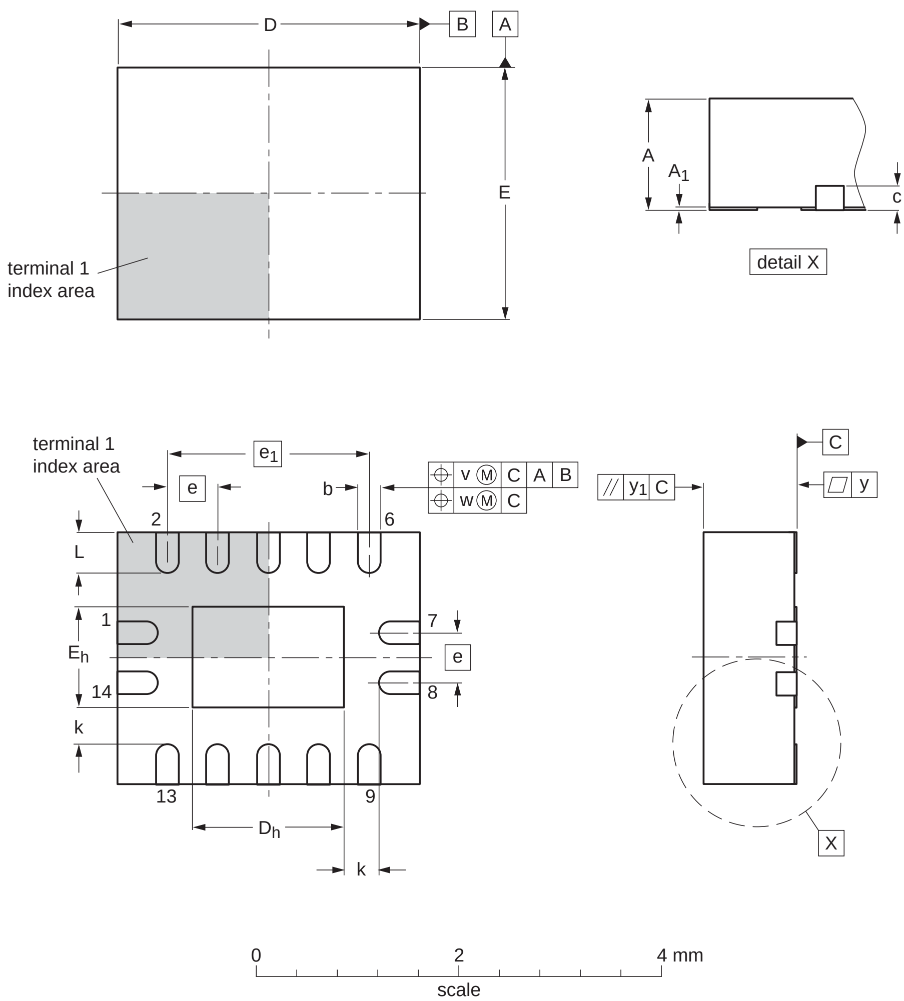
**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT402-1 | | MO-153 | | | | ~~99-12-27~~<br>03-02-18 |

**Fig 18. Package outline SOT402-1 (TSSOP14)**

**DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm** **SOT762-1**




Dimensions (mm are the original dimensions)

| Unit | | $A^{(1)}$ | $A_1$ | b | c | $D^{(1)}$ | $D_h$ | $E^{(1)}$ | $E_h$ | e | $e_1$ | k | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 1 | 0.05 | 0.30 | | 3.1 | 1.65 | 2.6 | 1.15 | | | | 0.5 | | | | |
| | nom | | 0.02 | 0.25 | 0.2 | 3.0 | 1.50 | 2.5 | 1.00 | 0.5 | 2 | | 0.4 | 0.1 | 0.05 | 0.05 | 0.1 |
| | min | | 0.00 | 0.18 | | 2.9 | 1.35 | 2.4 | 0.85 | | | 0.2 | 0.3 | | | | |

Note
1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

*sot762-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT762-1 | | MO-241 | | | | ~~15-04-10~~<br>15-05-05 |

**Fig 19. Package outline SOT762-1 (DHVQFN14)**

## 15. Abbreviations

**Table 10. Abbreviations**

| Acronym | Description |
|---|---|
| CMOS | Complementary Metal Oxide Semiconductor |
| LSTTL | Low-power Schottky Transistor-Transistor Logic |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |
| MIL | Military |
| TTL | Transistor-Transistor Logic |

## 16. Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74HCU04_Q100 v.2 | 20151022 | Product data sheet | - | 74HCU04_Q100 v.1 |
| Modifications: | • Conditions $V_{IL}$ and $V_{IH}$ corrected (errata). | | | |
| 74HCU04_Q100 v.1 | 20130131 | Product data sheet | - | - |

# 17. Legal information

## 17.1 Data sheet status

| Document status[1][2] | Product status[3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

## 17.2 Definitions

**Draft —** The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet —** A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification —** The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

## 17.3 Disclaimers

**Limited warranty and liability —** Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia.

In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of Nexperia.

**Right to make changes —** Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use in automotive applications —** This Nexperia product has been qualified for use in automotive applications. Unless otherwise agreed in writing, the product is not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications —** Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

**Limiting values —** Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale —** Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nexperia.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

**No offer to sell or license —** Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control —** This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

**Translations —** A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

### 17.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 18. Contact information

For more information, please visit: **http://www.nexperia.com**

For sales office addresses, please send an email to: **salesaddresses@nexperia.com**

## 19. Contents


| | | |
|---|---|---|
| **1** | **General description** | **1** |
| **2** | **Features and benefits** | **1** |
| **3** | **Ordering information** | **1** |
| **4** | **Functional diagram** | **2** |
| **5** | **Pinning information** | **2** |
| 5.1 | Pin description | 3 |
| **6** | **Functional description** | **3** |
| **7** | **Limiting values** | **3** |
| **8** | **Recommended operating conditions** | **4** |
| **9** | **Static characteristics** | **4** |
| **10** | **Dynamic characteristics** | **5** |
| **11** | **Waveforms** | **6** |
| **12** | **Typical transfer characteristics** | **6** |
| **13** | **Application information** | **8** |
| **14** | **Package outline** | **10** |
| **15** | **Abbreviations** | **13** |
| **16** | **Revision history** | **13** |
| **17** | **Legal information** | **14** |
| 17.1 | Data sheet status | 14 |
| 17.2 | Definitions | 14 |
| 17.3 | Disclaimers | 14 |
| 17.4 | Trademarks | 15 |
| **18** | **Contact information** | **15** |
| **19** | **Contents** | **16** |

Живое партнерство

ООО «ЛайфЭлектроникс» "LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

*Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.*

*С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров*

*Мы предлагаем:*

- *Конкурентоспособные цены и скидки постоянным клиентам.*
- *Специальные условия для постоянных клиентов.*
- *Подбор аналогов.*
- *Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.*

- *Приемлемые сроки поставки, возможна ускоренная поставка.*
- *Доставку товара в любую точку России и стран СНГ.*
- *Комплексную поставку.*
- *Работу по проектам и поставку образцов.*
- *Формирование склада под заказчика.*

- *Сертификаты соответствия на поставляемую продукцию (по желанию клиента).*
- *Тестирование поставляемой продукции.*
- *Поставку компонентов, требующих военную и космическую приемку.*
- *Входной контроль качества.*
- *Наличие сертификата ISO.*

*В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.*

*Конструкторский отдел помогает осуществить:*

- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
- *Защиту от снятия компонента с производства.*
- *Оценку стоимости проекта по компонентам.*
- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

*Тел: +7 (812) 336 43 04 (многоканальный)*
*Email: org@lifeelectronics.ru*

***www.lifeelectronics.ru***